DOCUMENT RESUME

ED 244 100 CE 038 931

TITLE Learning to Read and Write the Electronics Way.
INSTITUTION California State Dept. of Education, Sacramento. Div. of Vocational Education.; California State Univ., Los Angeles. Dept. of Industrial Studies.
PUB DATE [83]
NOTE 48p.; For related documents, see CE 038 922-933. Developed by the Educationally Disadvantaged Committee, Industrial Education InService Project.
AVAILABLE FROM VOICE, California Dept. of Education, 721 Capitol Mall, Sacramento, CA 95814.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Basic Skills; Behavioral Objectives; Check Lists; Content Area Reading; *Educationally Disadvantaged; *Electricity; *Electronics; Equipment Utilization; Field Tests; Instructional Materials; Learning Activities; Library Skills; Measurement Equipment; Puzzles; *Reading Skills; Secondary Education; Shop Curriculum; Skill Development; Spelling; *Trade and Industrial Education; Vocabulary; Vocabulary Development; *Writing Skills

ABSTRACT

This curriculum guide, one of 15 volumes written for field test use with educationally disadvantaged industrial education students needing additional instruction in the basic skill areas, deals with helping students to develop basic reading and writing skills while studying electronics. Addressed in the individual units of the guide are the following topics: using the volt-ohm-milliammeter (VOM) to measure ohms, mastering the technical vocabulary used in the fields of electricity and electronics, using the library, and reading and spelling the names of electrical tools and equipment. Each unit contains some or all of the following: a discussion of the major concepts of the technique being covered, instructions to the teacher concerning the use of the given technique, suggested related activities, student instructions, a student assignment, supplemental activities, and one or more worksheets. A basic skills checklist and a basic skills verification form are also provided to assist teachers in identifying those students who require additional help with basic skills. (MN)

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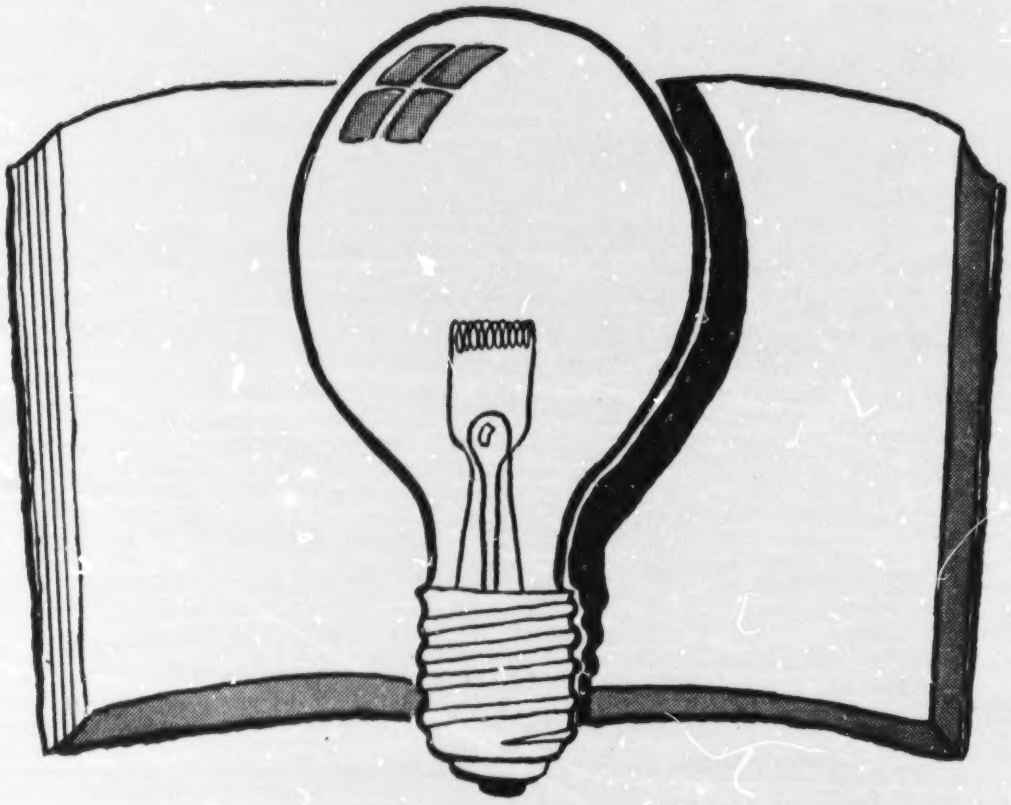
"LEARNING TO READ AND WRITE THE ELECTRONICS WAY"



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in cooperation with

The California State Department of Education

Office of Vocational Education
Field Operations Section
Industrial Education Unit

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INTRODUCTION

These instructional techniques were developed for those industrial education students who demonstrate a need for additional instruction in the areas of reading, writing, math, verbal and visual communication. They were written by industrial education teachers with a particular emphasis upon teaching a basic skill while retaining a major focus on the subject areas of auto, woods, metals, electronics, and drafting.

Each of these instructional techniques were written using the same format and with guidance from an expert in the areas of reading, writing, math, verbal and visual communication.

In order to help you identify those students who require additional help with the basic skills, a simple easy-to-use BASIC SKILLS CHECKLIST is provided with each subject area module. This Basic Skills Checklist will enable you as the Industrial Education Teacher to better identify those students in your classes who require additional help in the basic skills.

Additionally, a BASIC SKILLS VERIFICATION FORM is provided which will enable you to ask your school's reading resource teacher, basic skills teacher, math resource teacher, Hart Bill Conferencing teacher, or grade counselors, to verify your identification and provide you with help in the instruction of the basic skills.

You may wish to use these techniques as instruction for your entire class, or as a take-home, parent-involvement assignment. They may also be used in your school's reading or math lab or in conjunction with your school's basic skills instructional programs.

These instructional techniques are successful because your students are able to relate reading, writing, math, verbal and visual communication to their own industrial education classes. When your students succeed, they feel good about themselves, good about their schools, and good about their future.

Name _____ _____

CONFIDENTIAL Grade _____ Class _____

Date _____

BASIC SKILLS CHECKLIST (ELECTRONICS)

The following is a list of the basic skills (reading, writing, math, verbal and visual communication) that the student should demonstrate an ability in for the purpose of employment or advanced training in the electronics trades.

1.0 Verbal Communication: The student needs additional instruction in verbal communication if any of the items below are checked NO:

1.1 Yes ___ The student understands verbal directions or information given by the teacher.

No ___ Example: The teacher informs the student that electrical power must be turned off when making electrical connections. Does the student follow verbal instructions as required? Does the student follow safety rules as required? Does the student turn the power switch to "off"?

1.2 Yes ___ The student asks questions about instructions or information not understood.

No ___ Example: Did the student ask questions about the operation of an oscilloscope if it appears that the verbal instructions were not clearly understood?

1.3 Yes ___ The student is able to apply information and directions heard to
No ___ work situations.

1.4 Yes ___ The student is able to verbally communicate with the teacher and other students.

No ___ Example: Is the student able to convey instructions or information on how to etch printed circuit boards?

2.0 Writing: The student needs additional instruction in writing if any of the items below are checked NO:

2.1 Yes ___ The student is able to summarize and write a customer work order.

No ___ Example: A customer complains of "no picture and no sound" on a television receiver; is the student able to convey this problem and suggest corrective procedures in writing on the customer work order?

2.2 Yes ___ The student is able to communicate in writing instructions for a job to be performed.

No ___ Example: Is the student able to write a step-by-step procedure for measuring resistance using a volt-ohmeter?

2.3 Yes ___ The student is able to write a report on the operational function of an electronic component or project.

No ___ Example: Is the student able to describe, in writing, how a fullwave bridge rectifier power supply works?

3.0 Reading: The student needs additional instruction in reading if any of the items below are checked NO:

3.1 Yes ___ The student is able to read and understand job related materials.

No ___ Example: Is the student able to read and understand reference

manuals, safety rules and regulations, specifications, etc?

3.2 Yes ___ The student is able to follow step-by-step procedures on an instruction or job sheet.

No ___ Example: In constructing electronic projects, the student fails to follow the assembly instructions.

3.3 Yes ___ The student is able to read and understand current state of the art developments from periodicals and newspapers.

No ___ Example: The student is requested to read an article from the magazine POPULAR ELECTRONICS. Is the student able to relate both general and specific details from the article?

4.0 Math: The student needs additional instruction in math if any of the items below are checked NO:

4.1 Yes ___ The student is able to perform simple arithmetical operations i.e., addition, subtraction, multiplication and division of whole numbers, decimals and fractions.

No ___ Example: Is the student able to make simple computations that are common to electronics; total voltage drop in a series circuit.

4.2 Yes ___ The student is able to convert exponents to fractional equivalents and metric units.

No ___ Example: Is the student able to understand common conversion units, i.e., 10^{-3} = Milli = 1/1000 ?

4.3 Yes ___ The student is able to compute formulae which requires the use of decimals, squared numbers, multiplication and division.

No ___ Example: Is the student able to apply mathematical concepts to common electronics formulae, i.e., Ohm's Law and Kirchoff's Law.

4.4 Yes ___ The student is able to compute percentages and ratios.

No ___ Example: Is the student able to make simple mathematical computations applied to common electronics concepts? i.e. percentage of tolerance for resistors.

4.5 Yes ___ The student is able to read a ruler and make linear measurements.

No ___ Example: Is the student able to transfer dimensions from a scaled drawing to an actual chassis?

4.6 Yes ___ The student is able to compute hourly rate, multiplied by the number of hours worked to determine the weekly take-home pay.

No ___ Example: A first-year apprentice electrician earns 40% of the journeyman electrician hourly rate of $14.60. The apprentice works a typical 40-hour week, 10% of the pay is withheld for union dues and fringe benefits, 22% is withheld for state and federal income tax. What is the apprentice's net weekly pay?

5.0 Visual Communication: The student needs additional instruction in visual communication if the item below is checked NO:

5.1 Yes ___ The student can communicate to self and others with simple sketches or drawings.

No ___ Example: Is the student able to draw or sketch an item they wish to construct?

Identification Made By: _____ Date _____

BASIC SKILLS VERIFICATION FORM

Student _____ Male_____ Female____ Grade Level_____

Teacher _____ Class_____ Date_____

The Basic Skills Check List (attached) for the above student indicates a need for instructional assistance in the basic skills (reading, writing, math, verbal or visual communication). The following verification and recommendations are made:

_____Lacks Reading Skills

_____Lacks Writing Skills

_____Lacks Mathematical Skills

_____Lacks Verbal Communication Skills

_____Lacks Visual Communication Skills

METHOD USED FOR VERIFICATION

Recent Test Scores:

Test	Score	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____

Other Verification Methods:

_____

_____

RECOMMENDATIONS

The following instructional assistance is recommended: _____

_____

Verification & Recommendations Made By: _____ Date:_____

Title:_____

_____

_____

FOLLOW UP

Action Taken: _____

Results: _____Qualified for advanced training

_____Qualified for employment in the trade

_____Other_____

Certified by: _____ Date:_____
Teacher

How to Use the VOM (volt-ohm-millammeter) To Measure OHMS

(Reading)

Electronics Read/Write 1

HOW TO USE THE VOM (VOLT-OHM-MILLIAMMETER)

TO MEASURE OHMS

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

Following written instructions

b. What student learning problem(s) prompted the development of this technique?

1. Students have difficulty following a set of written instructions.

2. Students have trouble knowing how to set up and read a VOM.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Give each of your students one of the attached sheets as he/she is being introduced to the VOM.

b. Instruct students to keep the materials for reference as needed.

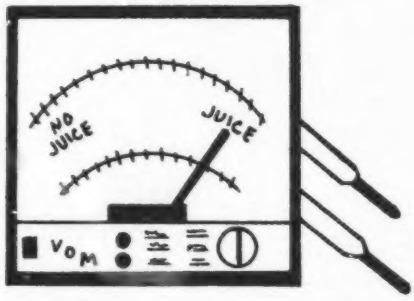
(This technique should provide the student enough information for him/her to practice until he/she is successful at the task.)

3. SUGGESTED RELATED ACTIVITIES:

Write another set of step by step instructions for a different piece of test equipment in your shop.

HOW TO USE THE VOM (VOLT-OHM-MILLIAMMETER)

TO MEASURE OHMS



STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Set the VOM in front of you in a vertical position. Be careful always in handling the VOM. It is easily damaged.

b. Find the FUNCTION switch. Turn it to DC/OHMS.

c. Find the RANGE switch. Turn it to Rx100. Rx100 means RESISTANCE (the number the needle is pointing to) times 100.

d. Put the RED wire lead into the RED or + jack (hole).

e. Put the BLACK wire lead into the BLACK or - (sometimes called common) jack (hole).

f. Touch the ends of the RED and BLACK leads together. The needle should move to ZERO on the OHMS SCALE of the meter face.

g. Find the ZERO ADJUST knob. Turn it right and left. Keep the RED and BLACK leads together as you adjust the ZERO ADJUST knob. Turn the ZERO ADJUST knob until the needle is on ZERO on the OHMS scale.

h. Separate the RED and BLACK leads. The needle should now return to ∞ (infinity).

i. Now place the RED lead on one end of the "resistance to be measured" and the BLACK lead on the other end of the "resistance to be measured".

j. See what number the needle is pointing to on the OHMS scale and multiply it times 100 since the RANGE switch is set on Rx100.

k. The most accurate meter readings are those where the needle is near center scale, so now turn the RANGE switch to Rx10.

HOW TO USE THE VOM (VOLT-OHM-MILLIAMMETER)

TO MEASURE OHMS

l. Place the RED and BLACK leads across the "resistance to be measured". Is the needle nearer the center of the scale? If not, put the RANGE switch on Rx10K (K means 1000 so 10K means 10,000) and see if the needle is nearer the center of the OHMS scale. Try the RANGE switch set at Rx100K and again at Rx1. Use the switch setting that brings the needle nearest the center of the OHM scale.

m. Note, you will have to "ZERO" the meter each time you change from one RANGE switch setting to another. In other words, repeat steps f and g each time you change switch setting. (This is only true when measuring OHMS.)

n. Review all steps above for several more resistors until you become familiar with the use of the VOM to measure OHMS.

Here are some things that may give you trouble:

1. If the batteries in the VOM are discharged you will have trouble getting the needle to "ZERO" and/or return to INFINITY (∞).

2. The leads must make good contact both in the jacks and on the resistance to be measured.

3. If you have your fingers on the metal parts of either leads or the resistance to be measured you may be measuring the resistance of your own body. This may give you a reading that is not accurate.

4. To make good contact between the leads and the resistance to be measured you may have to scratch the lead tip into or onto the resistor.

5. Deciding what line means what on the OHMS scale is difficult. If there are 4 lines between the numbers 10 and 15, then each line represents one. If there are 4 lines between 10 and 20, each line is two. If there are 4 lines between 1 and 2, each line represents .2 .

2. EXTRA THINGS THAT YOU CAN DO:

Make your own step by step list for the use of an electronics tool.

WORD BINGO

(Spelling)

Electronics Read/Write 2

WORD BINGO

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

1. Recognition of printed words
2. Correct spelling of words
3. Recognition of components, parts and/or equipment that the words represent
4. Recognition of words when verbalized

b. What student learning problem(s) prompted the development of this technique?

1. Students have difficulty recognizing the words used to identify technical parts, components, tools and equipment used in electronics.
2. Students are unable to spell the words correctly.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Have about 50 components, parts, tools and/or equipment clearly labelled and set about the lab.

b. Have a supply (at least one per student) of Bingo sheets. (See attached.)

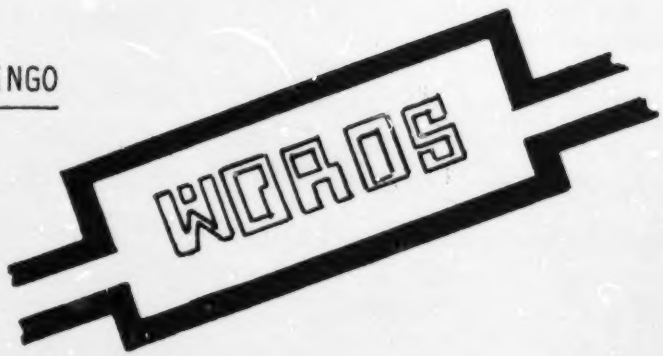
c. Beforehand, prepare the names of the 50 items on separate 3 x 5 cards (or smaller) for yourself.

d. Decide ahead of time what prizes or incentives you will offer to the winners.

3. SUGGESTED RELATED ACTIVITIES:

You might try Bingo with electronic symbols or inventors.

WORD BINGO



STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. We are playing word Bingo today to help you learn names and recognize _____(parts, components, etc.)

b. Take your Bingo sheet and walk around the room, filling in the squares with the name of a _____ (part, component, etc.)

c. Correct spelling is essential.

d. Return to your seat at _____.

e. Now, as I call out the names that I have on my cards that have been shuffled, make a large "X" on the words that I call.

f. When you have 5 X's in a row, either vertically, horizontally, or diagonally, yell "Bingo".

g. I will then check your sheet for correct words and spelling.

h. If you are the first winner you will win _____; the 2nd winner will win _____; the 3rd winner will win _____; and all others will win _____. (Actually, you are all winners since you have learned words and meanings).

2. STUDENT ASSIGNMENT:

Your Bingo Sheet is found on STUDENT PAGE 2.

3. EXTRA THINGS THAT YOU CAN DO:

Make up your own Bingo Cards using electronic symbols and you be the "caller" for the class.

B I N G O

Name_____

Period_____

		free space		

1. Fill in each square with a different _____ (part, component, etc.).
2. Correct spelling is essential.
3. Move about the room to collect the names.
4. Return to your seat at _____.
5. Wait for further instructions.

VOCABULARY CROSSWORD PUZZLE

(Vocabulary)

Electronics Read/Write 3

VOCABULARY CROSSWORD PUZZLE

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

This technique will teach the skill of visual communication.

b. What student learning problem(s) prompted the development of this technique?

Students have difficulty learning technical vocabulary. The student also needs to be introduced to other forms of vocabulary practice.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Compile a list of words you consider important to help understand more fully the safety unit.

b. Use an electronic dictionary to aid in writing a meaningful definition for each word.

c. List the words with their meanings alphabetically to create your Technical Glossary. (Appendix 1)

d. Develop a crossword puzzle using some of these words. (It is not necessary to use every word.)

e. Do not create a monster for the first puzzle. Keep the total of words less than twenty. Allow for open space. Don't try and have all of the words cross if this is to be the students' first crossword puzzle experience.

f. Issue the Technical Glossary to the class. Read the Technical Glossary to your class and explain to them that they will have a written exercise using the glossary.

g. Issue the Crossword Puzzle to the class.

3. SUGGESTED RELATED ACTIVITIES:

This is an excellent exercise for a substitute teacher. Use the glossary from your text as a source of words and allow the student to use the text when solving the puzzle.

VOCABULARY CROSSWORD PUZZLE

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Listen carefully as your teacher reads the Technical Glossary.

b. Ask questions concerning terms or statements you do not understand.

c. Solve the Crossword Puzzle with/without the aid of the Technical Glossary.

2. STUDENT ASSIGNMENT:

Your assignment is found on STUDENT PAGE 2.

3. EXTRA THINGS THAT YOU CAN DO:

a. Develop a crossword puzzle.

b. Check with your instructor for additional puzzles to be worked on at home for extra credit.

STUDENT PAGE 1

TECHNICAL GLOSSARY

SAFETY

ACCIDENT:	An unplanned or unexpected occurence usually resulting in injury. Most common shop accidents can be prevented by observing safety rules, working carefully, and using common sense.
ARTIFICIAL RESPIRATION:	A life saving procedure used to revive a person who has stopped breathing. Artificial respiration may be required as a result of electrical shock, drowning, strangling, etc.
CARDIAC ARREST:	A loss of heartbeat caused by electrical shock, or high blood pressure. Closed cardiac massage is the recommended first aid procedure.
ELECTRIC SHOCK:	The flow of an electric current through the body. Shock can cause such physical effects as muscle twitching or paralysis, burns, interruption of breathing, unconsciousness, ventricular fibrillation, cardiac arrest, or death.
FIRE:	A combustion process characterized by heat, flame, and light. There are three general classes of fire: Class A fires involve wood, paper, rubbish, and fabrics; Class B fires involve oil, grease, gasoline, paints, and solvents; Class C fires involve insulation and other combustible materials in electrical and electronic equipment.
FIRE EXTINGUISHER:	A portable, self-contained device holding a liquid, or chemical which can be sprayed on a fire to extinguish it.
FIRST AID:	Emergency treatment for injury, accidents, or sudden illness generally administered before regular medical care is available.
FLAMMABLE:	A designation for types of materials which are easily ignited or set on fire. Other designations may be used to identify these materials, such as: combustible or inflammable.
GROUNDING:	A safety precaution which calls for placing the metal housing or case of a device at ground potential to prevent possible operator shock. Most commonly, a third wire is added to the power cord. This wire is connected between the case and earth ground allowing an alternate path for current flow. Thus, if the metal housing of a device becomes electrically "hot", current will flow through the grounding wire to the earth, instead of through the operators body to earth.

TECHNICAL GLOSSARY

SAFETY

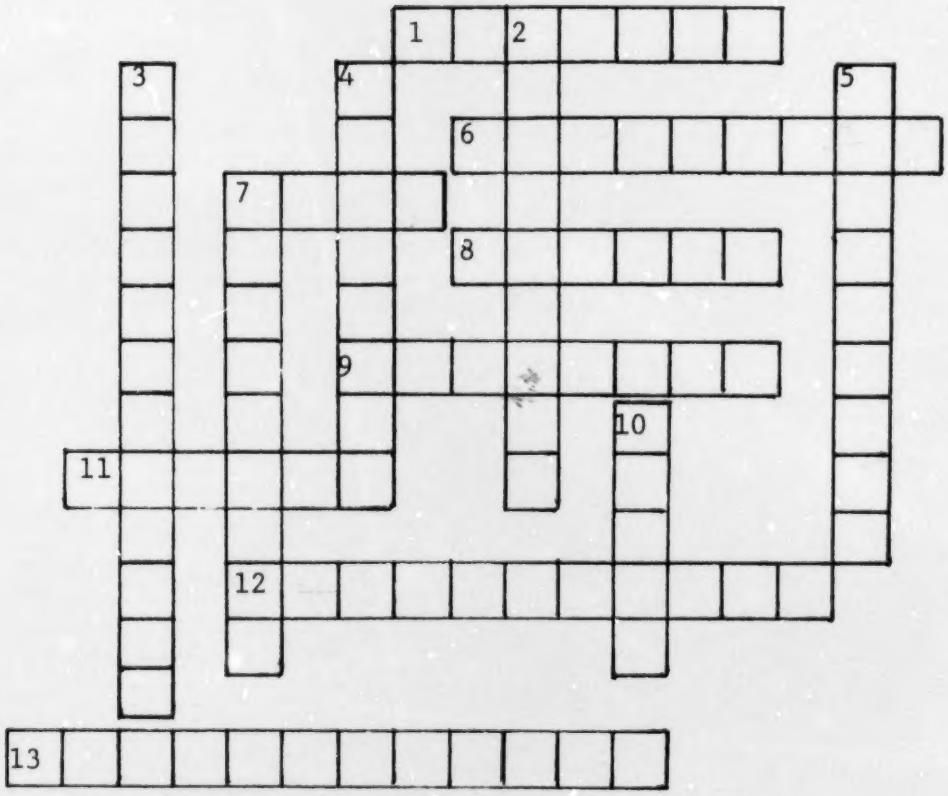
HAND TOOLS:	This term refers to a wide variety of tools which require physical manipulation or primarily the use of your arms and hand muscles for their operation. Examples of typical hand tools would be: screwdrivers, wrenches, soldering irons, piers, etc.
HAZARD:	The presence of a dangerous or potentially dangerous situation.
HORSEPLAY:	The undesired, potentially hazardous, activity of clowning or playing in the shop or laboratory.
INJURY:	Physical harm or damage to one's body.
LIVE CIRCUIT:	An electrical circuit which is energized (power applied switch on) and capable of producing current flow.
MACHINE TOOLS:	Generally, power assisted tools utilized for "heavy" jobs which require work beyond that supplied by hand tools. Examples of machine tools: drill press, grinders, sheet metal shears, box and pan break, etc.
SAFETY GLASSES:	Protective eye glasses with shatter proof lenses and side shields. Safety glasses should be worn at all times when necessary while working in the shop. They provide invaluable protection by preventing foreign materials (pieces of wire, chips, broken glass, chemicals etc.) from entering or coming in contact with the eyes. Goggles and face shields can be utilized to provide additional eye protection while working in extremely hazardous areas.
SAFETY PRECAUTION:	An action taken, followed or observed, to avoid a possible hazard or dangerous situation.
SAFETY RULES:	A specific list of rules designed to identify common accident causing situations and hazards. By observing the safety rules many accidents will be avoided or prevented.
VENTRICULAR FIBRILLATION:	A type of heart failure, caused by electric shock, in which the heart muscle no longer beats in a regular fashion but rather quivers erratically. If this condition is not corrected rapidly, death will result.

VOCABULARY CROSSWORD PUZZLE

WORKSHEET

Name_____

Shop #_____ Date_____



WORDS:

fire
goggles
horseplay
fibrillation
hand tools
shock
accident
flammable
injury
live circuit
hazard
grounding
first aid
extinguisher

ACROSS

1. Eye protection used in place of, or along with safety glasses.
6. Clowning or potentially dangerous play.
7. Combustion.
8. Damage to your body.
9. An unplanned or unexpected injury.
11. A potentially dangerous situation.
12. An energized circuit.
13. A device used to put out fires.

DOWN

2. An electrical safety precaution which places the devices metal housing at ground potential.
3. A loss of heartbeat.
4. Emergency treatment for injuries.
5. Tools that require primarily the use of your muscles for operation.
7. Materials which are easily ignited.
10. The flow of an electric current through the body.

STUDENT PAGE 2

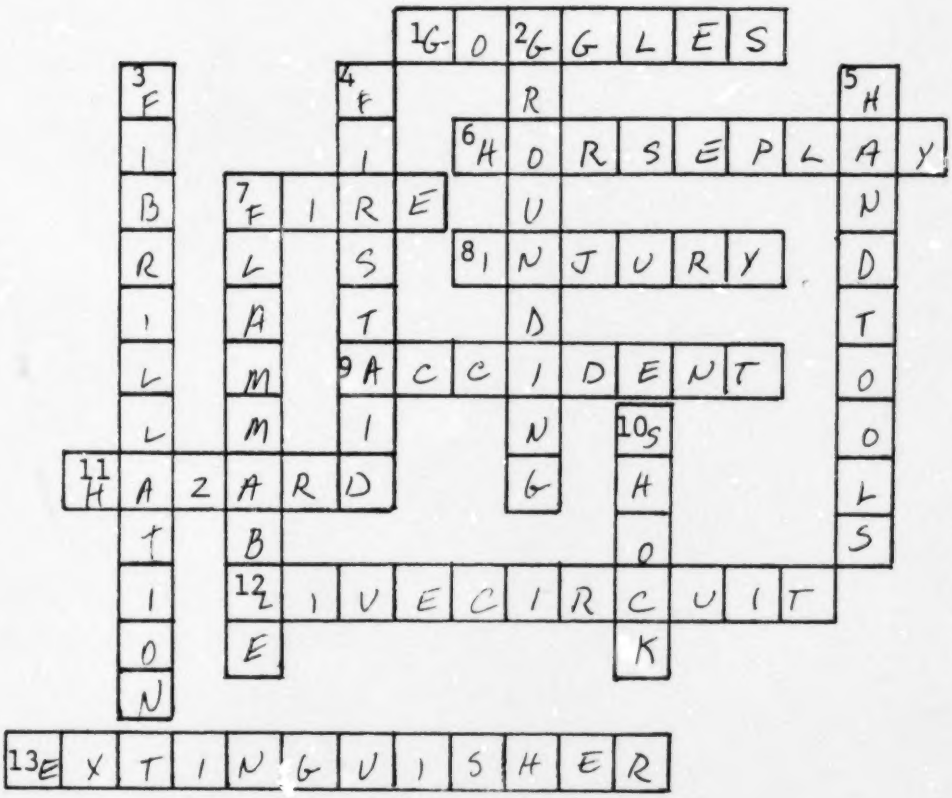
VOCABULARY CROSSWORD PUZZLE

WORKSHEET

KEY

Name_____

Shop #_____ Date_____



WORDS:

fire
goggles
horseplay
fibrillation
hand tools
shock
accident
flammable
injury
live circuit
hazard
grounding
first aid
extinguisher

ACROSS

1. Eye protection used in place of, or along with safety glasses.
6. Clowning or potentially dangerous play.
7. Combustion.
8. Damage to your body.
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"Where to Find It"

(Reading)

Electronics Read/Write 4

"WHERE TO FIND IT"

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

1. Reading for details

2. Study-locational skills

b. What student learning problem(s) prompted the development of this technique?

Students lack skill in using the index and/or table of contents to find information.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Make available to each student a textbook and other reference materials such as catalogues, periodicals and wall charts.

b. Have the students search and find specific information you ask for, not saying where they will find such information.

c. A sample list of items to find is found on Student Page 2.

3. SUGGESTED RELATED ACTIVITIES:

A good exercise for more advanced electronics students is to have them find the total cost of all parts on a given project parts list. They will get lots of practice reading for details and will also become impressed about the cost of parts.

"WHERE TO FIND IT"

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Take the following list and search for each item in your textbook, catalogue, magazine, wall chart, or wherever else you think it might be.

b. Write down where you found it. If you found it in your text, write "text page _____". If you found it in a magazine, give the name of the magazine, date, name of article, and page. No matter where you found the information, describe the source.

c. When completed with the list, turn in your paper.

2. STUDENT ASSIGNMENT:

Your assignment is found on Student Page 2.

3. EXTRA THINGS THAT YOU CAN DO:

Study a catalogue to discover the differences in cost of parts and see if you can tell why some parts are more expensive than others.

"WHERE TO FIND IT"

TRY THIS LIST FOR STARTERS:

WHERE WILL YOU FIND:

1. A DEFINITION FOR FREQUENCY?
2. HOW A TRANSFORMER WORKS?
3. HOW A CAPACITOR WORKS IN AN AC CIRCUIT?
4. THE SYMBOL FOR A ZENER DIODE?
5. A PICTURE OF AN OSCILLISCOPE?
6. HOW TO FIND THE RESISTANCE TOTAL OF A PARALLEL CIRCUIT?
7. THE DIFFERENCE IN COST OF A 1000 OHM 1/2 WATT RESISTOR AND A 1000 OHM 10 WATT RESISTOR?
8. PICTURES OR DIAGRAMS OF HOW A GENERATOR WORKS?
9. WHAT AN FET IS?
10. ALL ABOUT POWER SUPPLIES?

Flash Cards - Technical Terms

(Vocabulary)

Electronics Read/Write 5

FLASH CARDS - TECHNICAL TERMS

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

1. Recognition of technical terms
2. Definition of technical terms
3. Correct spelling of terms

b. What student learning problem(s) prompted the development of this technique?

The subject of electronics contains a large number of terms that are new to students. These terms bring problems of discovering meanings and learning the correct spelling as well as being able to recognize the new terms.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Have your students write on a sheet of paper as many new electronic terms as they can.

b. Compile a class list from their contributions.

c. Have each student, partnership, or small group of students take a given number of these terms and print them on separate portions of heavy paper (something you can't see through but can still cut with scissors).

d. On the reverse of each portion, have them print the definition of the term.

e. Cut the portions apart and use as flash cards. Laminate the sheet before separation if you plan to use the flash cards repeatedly.

f. Rotate the cards from group to group for testing or learning purposes.

3. SUGGESTED RELATED ACTIVITIES:

Use the same technique for electronics symbols, house wiring symbols, concepts such as R_T of series and parallel circuits.

FLASH CARDS - TECHNICAL TERMS

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. List as many electronics terms as you can that are new to you. These will be used to compile a class list of new terms.

b. After you are assigned a group of these terms, print each term on a sheet of heavy paper following the example on the attached sheet.

c. Now print each term's definition on the reverse side.

d. Cut the paper apart so that you have a flash card for each of the terms. Use these cards to learn the meanings of the terms following the instructions given to you by your teacher.

2. STUDENT ASSIGNMENT:

See the attached sheets.

3. EXTRA THINGS THAT YOU CAN DO:

You may wish to make a full set of flash cards for your own use so that your parents or family members can help you learn new electronic terms at home.

STUDENT PAGE 1

R_t=

OHMS

VOLT

UNIT OF MEASUREMENT FOR
ELECTRICAL RESISTANCE

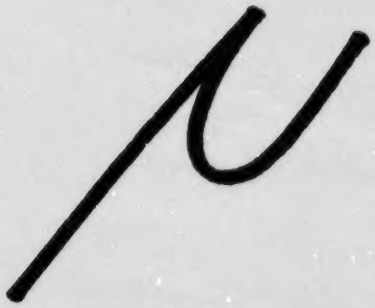
SERIES CIRCUIT

$R_T = R_1 + R_2 + R_3 + \text{ETC.}$

UNIT OF MEASUREMENT OF
EMF OR ELECTRICAL PRESSURE

OHMS

$R_t =$



AMPERE

RED

5.4

MICRO $\frac{1}{1,000,000}$

.000001

AS IN MICROAMPERE

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \text{ETC.}$$

COLOR FOR 2

OR POSITIVE LEAD

UNIT OF MEASUREMENT FOR

CURRENT FLOW.

LABEL IT

(Reading, Spelling)

Electronics Read/Write 6

LABEL IT

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

READING, SPELLING and the IDENTIFICATION of equipment, tools, etc.

b. What student learning problem(s) prompted the development of this technique?

1. Students have trouble identifying items in the electronics lab, especially the names of equipment and their spelling.

2. Sometimes students are confused about which tool is which.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Construct labels for all equipment, tools, rooms, benches, machines, off-limits areas, seat numbers, etc. that are not already labeled.

b. Attach the labels as visibly and as permanently as possible.

c. If the labeled item is something that you refer to frequently from your lecture or demonstration position, the label needs to be large.

d. Some items such as oscilloscopes are difficult, if not impossible, to label, so you may need to label the shelves or storage areas in which they are kept.

e. Students are prone to peel off or mar labels such as Dymo, so it is advisable to attach thinner labels using double sided tape covered with a coating of clear nail polish or urethane varnish.

3. SUGGESTED RELATED ACTIVITIES:

Play "WORD BINGO" occasionally using the words to reinforce the recognition and spelling of the words.

"LIBRARY"

Electronics Read/Write 7

"LIBRARY"

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

1. Reading
2. Research
3. Browsing written material

b. What student learning problem(s) prompted the development of this technique?

Students usually read only what is assigned. With the "Library" readily accessible they are more apt to pick up something based on interest.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Establish a specific place in the shop lab for display of magazines, pamphlets, etc.

b. Place a student in charge to keep track of things and to place magazines into an attractive display.

c. The display may include periodicals, catalogues, career pamphlets, reference books, dictionary, and "How to..." folders.

d. Encourage students to read selections from this "Library" during times when they have completed other assignments or projects.

3. SUGGESTED RELATED ACTIVITIES:

Offer incentives for students to bring appropriate and relevant materials to add to the "Library".

Request an annotated bibliography.

USING ELECTRICAL WORDS

(Vocabulary)

Electronics Read/Write 8

USING ELECTRICAL WORDS

TEACHER MATERIALS:

1. CONCEPTS OF TECNNIQUE:

a. What SKILL will this technique teach?

Technical vocabulary development.

b. What student learning problem(s) prompted the development of this technique?

Students have difficulty learning technical vocabulary. The student also needs to be introduced to other forms of vocabulary practice. Many students will consider this method a game and not a vocabulary exercise.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Give your students the glossary and the worksheet. Ask your students to read along as you read the glossary to them.

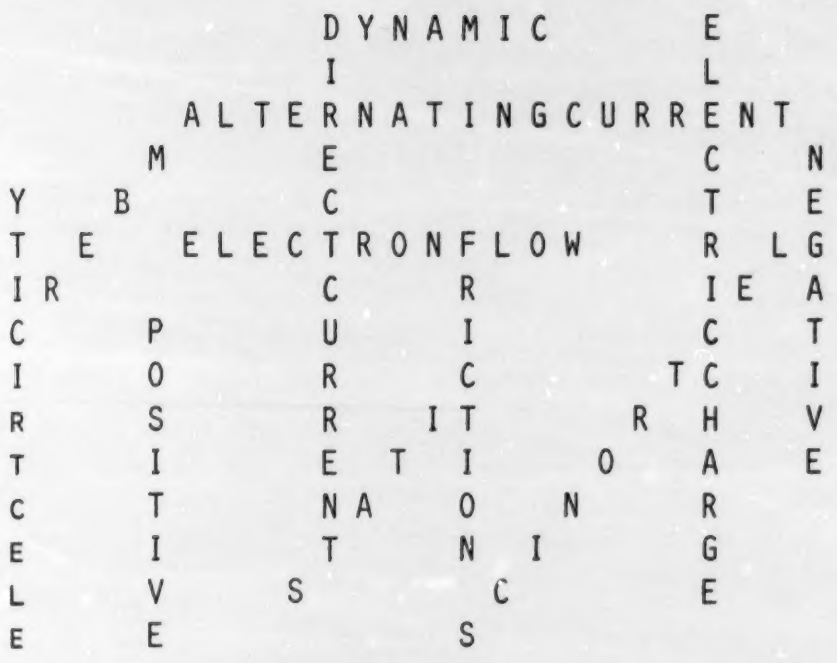
b. Have your students solve the word search puzzle and return it to you for grading. You may need to provide a brief explanation about how a word search puzzle works.

3. SUGGESTED RELATED ACTIVITIES:

Have students develop their own word search puzzles.

WORD SEARCH KEY

USING ELECTRICAL WORDS



USING ELECTRICAL WORDS

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Read the Technical Glossary as your teacher reads it to you. The glossary is found on STUDENT PAGE 2.

b. Read the instructions on the Word Search Worksheet and circle the words as indicated by the example.

2. STUDENT ASSIGNMENT:

Complete the Word Search Worksheet found on STUDENT PAGE 3.

3. EXTRA THINGS THAT YOU CAN DO:

Obtain a sheet of graph paper from the instructor and try developing a word search puzzle for extra credit.

TECHNICAL GLOSSARY

USING ELECTRICAL WORDS

ALTERNATING CURRENT:	A flow of electrons moving first in one direction through a circuit, stopping, then flowing in the opposite direction. Alternating current can be thought of as a back and forth movement of electrons. Abbrev. AC
DIRECT CURRENT:	A flow of electrons moving in one direction through a circuit - from negative to positive. Abbrev. DC
DYNAMIC ELECTRICITY:	A usable, flow or movement of electrical charges. Dynamic electricity provides a continuous flow of electrons which can be used to do work.
ELECTRIC CHARGE:	A collection of positive or negative particles on an object. A material having many negative particles collected on it is said to have a negative charge. While many positive particles provide a positive charge.
ELECTRICITY:	A form of energy, (generated by friction, induction, or chemical reaction) which is based upon the movement of free electrons.
ELECTRON FLOW:	The orderly movement of electrons through a wire, electrical device or circuit.
ELECTRONICS:	The study of electrical action, and especially the study and development of devices and circuits that use and control electricity.
ELEKTRON:	The Greek word for amber (a brownish-yellow fossil resin) which later evolved into the words "electrics" and "electricity".
STATIC ELECTRICITY:	A collection of electrical charges at rest. Static charges are basically an unusable source of electricity, yet can be very dangerous in the form of lightning.

WORD SEARCH WORKSHEET

Locate these electrical words in the puzzle below. Circle the words as you find them. Some of the words may be written on a diagonal, written backwards, forwards, or up and down.

AMBER	ELECTRONICS
ALTERNATING CURRENT	ELECTRICITY
DYNAMIC	FRICTION
DIRECT CURRENT	NEGATIVE
ELECTRIC CHARGE	POSITIVE
ELECTRON FLOW	STATIC

A B C D E F G H I D Y N A M I C J K L A E N Q P
Q S U W Z A O C B I E G F H S I R J Q K L P M O
T R T V Y A L T E R N A T I N G C U R R E N T C
U A D C M Z D V E E B J A G E O S E W X C O K N
Y V B B X E A G H C I O W K R U P N Y L T J V E
T A E X Z E L E C T R O N F L O W C Z S R E L G
I R W X W Y H J I C M H E R L S H E I D I E X A
C T B P P G K F K U T A I I O E F H U A C V W T
I C Q T O H B I J R A L N C V V O E V T C H E I
R S N U S B O L N R H D I T E P E S R G H S I V
T R T O I P Q M C E T T V I H G T O O F A A Y E
C M S C T B Q R T N A M A O S H N T O O R O O M
E E D K I A V P S T O P H N A I E R U K G N O J
L F H J V V C W S P W E D T C H U C Y P E L Z Q
E I G L E O N A O P L L H S B A D K C J Z R X T

THE FOLLOWING INDUSTRIAL EDUCATION BASIC SKILL INSTRUCTIONAL TECHNIQUES ARE AVAILABLE FROM:

VOICE (VOCATIONAL OCCUPATIONAL INFORMATION CENTER FOR EDUCATORS)

721 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

"LEARNING TO READ AND WRITE THE AUTOMOTIVE WAY"
"LEARNING TO DO MATH THE AUTOMOTIVE WAY"
"LEARNING TO VERBALLY & VISUALLY COMMUNICATE THE AUTOMOTIVE WAY"

"LEARNING TO READ AND WRITE THE WOODWORKING WAY"
"LEARNING TO DO MATH THE WOODWORKING WAY"
"LEARNING TO VERBALLY & VISUALLY COMMUNICATE THE WOODWORKING WAY"

"LEARNING TO READ AND WRITE THE METALWORKING WAY"
"LEARNING TO DO MATH THE METALWORKING WAY"
"LEARNING TO VERBALLY & VISUALLY COMMUNICATE THE METALWORKING WAY"

"LEARNING TO READ AND WRITE THE ELECTRONICS WAY"
"LEARNING TO DO MATH THE ELECTRONICS WAY"
"LEARNING TO VERBALLY & VISUALLY COMMUNICATE THE ELECTRONICS WAY"

"LEARNING TO READ AND WRITE THE DRAFTING WAY"
"LEARNING TO DO MATH THE DRAFTING WAY"
"LEARNING TO VERBALLY & VISUALLY COMMUNICATE THE DRAFTING WAY"